

# Anatomy and Zoogeography of *Glossodoris sedna* and *Chromodoris grahmi* (Opisthobranchia: Nudibranchia) in the Tropical Western Atlantic and Caribbean

by

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*Abstract.* The eastern Pacific *Glossodoris sedna* is reported from the tropical western Atlantic Ocean, and the range of *Chromodoris grahmi* is extended throughout the extremes of the Caribbean Sea. The anatomies of the specimens are described and compared with original and subsequent descriptions of these species.

The following records are significant range extensions for two species of Chromodorididae.

*Glossodoris sedna* (Marcus & Marcus, 1967)

(Figures 1-2, 5-9)

**Synonymy and references:** The synonymy and tropical eastern Pacific distribution of *Glossodoris sedna* have been summarized by BERTSCH (1978b) and RUDMAN (1984).

**Material examined:** Two specimens (Figures 1, 2), 65 mm long; 2 m depth, Tavenier Key, Florida (approx. 25°01'N, 80°30'W); *leg.* Barry Hamann, 7 June 1983. Specimen A, radula illustrated in Figure 9, is deposited in the collections of the Los Angeles County Museum of Natural History (Malacology), LACM 83-147. Specimen B, radula illustrated in the scanning electron micrographs of Figures 5-8, has been deposited in the collections of the California Academy of Sciences, Department of Invertebrate Zoology and Geology, CASIZ 064510.

**Photographic records:** One specimen, Biscayne Bay, Florida; photo by Bill Lyons. One specimen, Pennekamp State Park, off Key Largo, Florida; photo by Roy Manstan, published on the cover of *Sea Frontiers*, March-April 1980.

This is the first report of *Glossodoris sedna* in the tropical western Atlantic.

**External morphology:** The coloration of the animals was white (or a dirty gray white), with two marginal bands: an inner red and an outer yellow band. Identically colored bands were also on the underside of the ruffled mantle margin and around the base of the foot. Gills and rhino-

phores were tipped with pinkish red. There are prominent folds and crenulations of the mantle margin. These patterns are nearly identical with those seen in typical *Glossodoris sedna* from the Gulf of California.

The only differences in external morphology between the Caribbean and Gulf of California animals were the shade of whiteness and the amount of crenulations. The specimens collected at Tavenier Key (Figures 1, 2) are a light grayish white (not the pure white that is usually seen in eastern Pacific specimens); moreover, they have far more crenulations in the mantle margin (12 or more) than are usually present in eastern Pacific animals. The coloration is only a shading difference, easily variable by dietary differences; it is not a significant color difference (*e.g.*, blue vs. green or red vs. yellow). The crenulations are known to vary within and between individuals and species of *Glossodoris*. RUDMAN (1986:132, figs. 20F-H) illustrated three different individuals of *G. rufomarginata* (Bergh, 1905) with single, few, or many crenulations. The Florida animal illustrated in *Sea Frontiers* (MANSTAN, 1980) had fewer crenulations than the specimens from Tavenier Key, more closely matching the crenulation pattern shown in the original drawing of *G. sedna* (MARCUS & MARCUS, 1967:179, fig. 34).

**Internal morphology:** The reproductive system matched that described by MARCUS & MARCUS (1967:179-180). The morphology of the penis and vas deferens, and the arrangement and relative size of the vagina, insemination duct, bursa copulatrix and receptaculum seminis, are all identical.

The radular formula of specimen A from Tavenier Key



#### Explanation of Figures 1 to 4

Figures 1 and 2. Living animals of *Glossodoris sedna*, 65 mm long, collected at Tavenier Key, Florida. Photo by Jeff Hamann.

Figure 3. Living animal of *Chromodoris grahamsi* from Kingston Harbor, St. Vincent, 20 mm long. Photo by Jeff Hamann.

Figure 4. Living animal of *Chromodoris grahamsi* from La Parguera, Puerto Rico. Photo by C. E. Cutress.

was 133 (54.1.54). The innermost tooth in each half row had denticles on both sides of the cusp (2 on the inside and 3 or 4 on the outer face). The rest of the teeth in each half row had 4–6 small denticles on the outer side of each cusp, but the outermost 10 teeth lacked these accessory denticles on the cusp (Figure 9).

The radular formula of specimen B from Tavenier Keys (Figures 5–7) was 128 (49.1.49). The innermost lateral

tooth of each half row had 3 or 4 inner and 4 or 5 outer denticles on the sides of the cusp (Figure 7). The outer lateral teeth had 6–8 denticles on the outer side of the cusp (Figure 6), except the outermost 19–21 teeth which were smooth (Figure 5). The jaw elements (Figure 8) are bifid; however some are trifid and there are several small accessory points on a few of the elements.

The holotype of *Glossodoris sedna* had a radular formula

#### Explanation of Figures 5 to 8

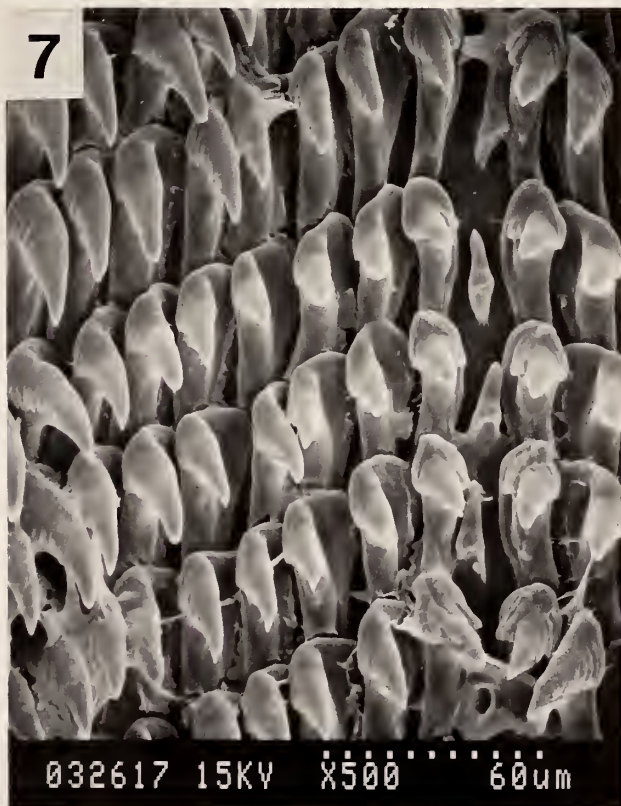
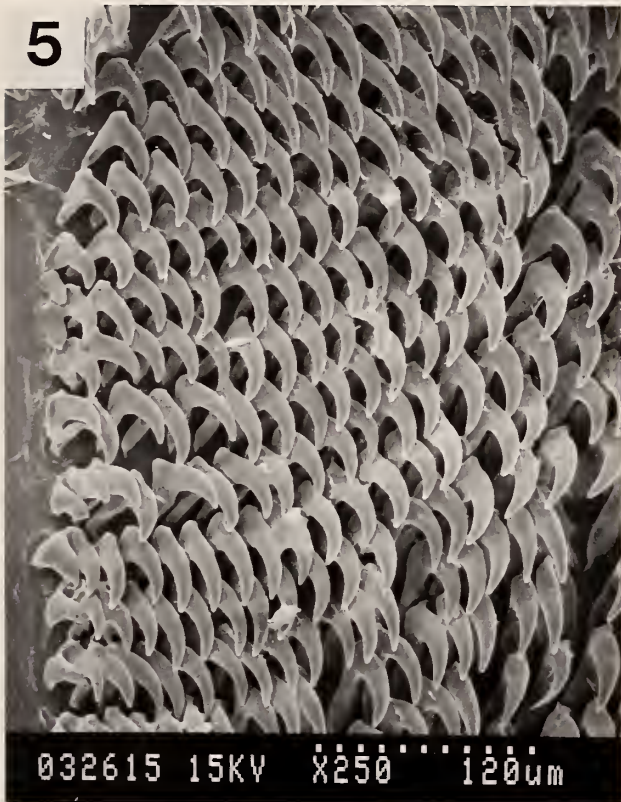
Scanning electron micrographs of the radula and jaws of *Glossodoris sedna*, specimen A, collected at Tavenier Key, Florida. SEMs by author.

Figure 5. Outermost marginal teeth.

Figure 6. Teeth from center of half row.

Figure 7. Rachidian and innermost lateral teeth.

Figure 8. Bifid jaw elements.



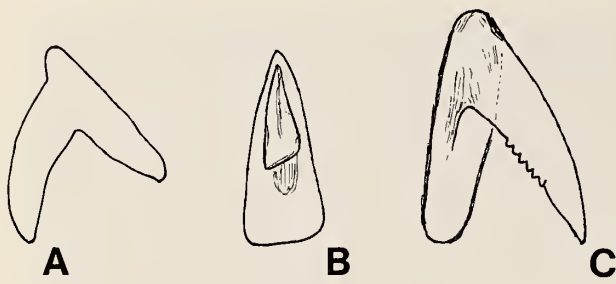


Figure 9

Sketches of radular teeth of *Glossodoris sedna*, specimen B, of Tavenier Key. A. Smooth outer marginal, posterior quarter of radula. B. Rachidian tooth. C. Denticulate lateral tooth from near the middle of the half row, one-third of the distance from the anteriormost end of radular ribbon.

of 130 (55.1.55); the innermost lateral tooth had 1 or 2 inner and about 5 outer denticles; the succeeding laterals had up to 7 denticles; and the outermost 25–35 teeth were smooth (MARCUS & MARCUS, 1967:180). The numerical counts of the Florida specimens closely match those of the holotype, and fall completely within the range of variation of the Gulf of California specimens described in the data and regression analyses of BERTSCH (1978b:71–76). The tooth shapes illustrated in Figures 5–7 match well those illustrated by BERTSCH (1978a:figs. 47–50).

The internal anatomy of the Florida animals is identical with that described for Gulf of California animals. The external anatomy is very similar (the only differences being a grayer body and more marginal ruffles). Given the overwhelming similarities, these differences are not sufficient to erect a new taxon. It is far more biologically reasonable to consider these west Atlantic specimens as *Glossodoris sedna*, with a slight variation of body tone and a tendency to more crenulations; this amount of morphological variation is certainly not unexpected and is consistent with the geographic separation and isolation of the population.

**Zoogeography:** This tropical eastern Pacific species is very common throughout the Gulf of California and along the Pacific coast of Mexico and Central America to the Galápagos (BERTSCH, 1978b). Numerous other species of nudibranchs are known to occur in both the Pacific and Atlantic (Caribbean) coasts of the tropical Americas (e.g., BERTSCH, 1979; GOSLINER & BERTSCH, 1985). However, *Glossodoris sedna* is unique in that its known western Atlantic occurrences are only from the southern tip of Florida, not throughout the various islands of the Caribbean. Curiously, the three Florida localities are all within 75 km of each other.

*Chromodoris grahami* Thompson, 1980

(Figures 3, 4, 10)

**Material examined:** One specimen, 8 mm long, 4 mm wide; shallow subtidal, Iron Castle Point, Porto Bello,

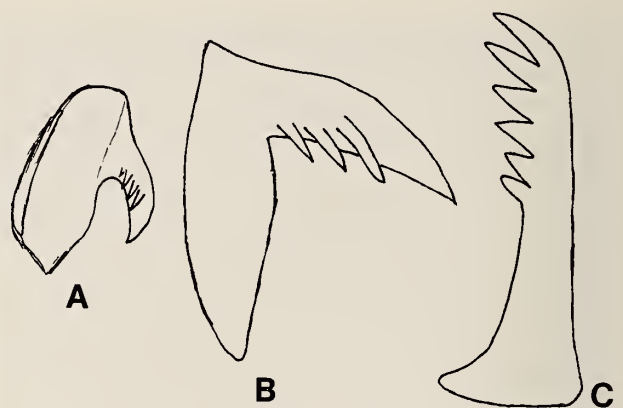


Figure 10

Sketches of radular teeth of *Chromodoris grahami*, specimen collected at Panama. A. Strongly curved innermost lateral tooth. B. Second lateral tooth, row 18. C. Elongate, pectinate condition of tooth from center of half row, tooth row 9.

Panama (9°33'30"N, 79°40'45"W); leg. H. Bertsch, 22 September 1974. Deposited in the collections of the Los Angeles County Museum of Natural History (Malacology) LACM 74-104.

**Photographic records:** One specimen, 20 mm long; shallow water 1 m deep, Kingston Harbor, St. Vincent (approx. 13°9'N, 61°14'W); leg. Jeff Hamann, January 1987 (Figure 3).

One specimen, La Parguera, Puerto Rico (approx. 17°58'N, 67°03'W); leg. Charles E. Cutress, December 1983 (Figure 4).

Prior to this study, *Chromodoris grahami* had been reported in only its original description.

**External morphology:** The dorsal color of the animals found at St. Vincent (Figure 3) and at Puerto Rico (Figure 4, shown on a pinkish red sponge) was a cloudy salmon pink with three irregular rows of bright red spots. The color bands around the rims of the mantle and foot were different. The specimen from Puerto Rico had only a white band, whereas the St. Vincent animal had an outer yellow line encircling the notum, inside of which was a very thin red line, which in turn enclosed a broad white band. THOMPSON (1980) described only yellow and white marginal bands.

The animal from Panama was pinkish red with darker red spots irregularly placed over the dorsum, and a prominent whitish marginal band around the notum. The rhinophores and gills were also pinkish red, with tinges of white at the tips or edges. This specimen also did not have the yellow and white mantle margin bands reported by THOMPSON (1980). It exhibited an inner cream-white band and an outer translucent edge around the margin of the mantle.

These three specimens show a small range of variation from the coloration originally described in the mantle mar-

gin. However, common to all known *Chromodoris grahami* is the fairly broad white band encircling the animal, with a salmon-pink dorsal color mottled with three rows of bright red spots.

**Internal morphology:** The radular formula of the specimen from Panama was 39 (26-27.0.26-27), similar to the 36 (23.0.23) formula reported by THOMPSON (1980:80). The innermost lateral tooth (Figure 10A) was strongly recurved (with 4 or 5 accessory denticles visible), while the outer laterals are more elongate (Figure 10B), approaching a pectinate condition (Figure 10C), as reported by THOMPSON (1980:80-81, fig. 5C).

Except for the slight variation in mantle margin coloration, these animals closely match the original description of *Chromodoris grahami*.

**Zoogeography:** The specimen from Panama represents a southern range extension of over 900 km, and the Puerto Rican and Lesser Antillean records are eastward range extensions of over 1000 and 1700 km respectively, from the only previously reported occurrence of *Chromodoris grahami* in Jamaica (approx. 18°N, 77°30'W). *Chromodoris grahami* is now known from four widely scattered Caribbean extremes (Panama, Jamaica, Puerto Rico, and St. Vincent). This species can be considered a shallow-water endemic throughout the Caribbean Sea.

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